

INTRODUCTION

The tests in this Recommendation have been developed on the basis of the requirements of the International Life-Saving Appliances (LSA) Code.

Life-saving appliances which are installed on board on or after 1 July 1999 should meet the applicable requirements of this Recommendation or substantially equivalent ones, as may be specified by the Administration. Where there has been a substantial change in the equipment performance requirements or the test procedures in this recommendation, an item of equipment previously tested to resolution A.521(13), or previous versions of resolution A.689(17), need only be subjected to tests affected by such changes.

Life-saving appliances which were installed on board before 1 July 1999 may meet the applicable requirements of the Recommendation on Testing of Life-Saving Appliances adopted by resolution A.521(13), previous versions of resolution A.689(17), or substantially equivalent ones, as may be specified by the Administration, and may continue in use on the ship on which they are presently installed, as long as they remain suitable for service.

Tests for requirements referred to in the LSA Code, which are not included in this Recommendation, should be to the satisfaction of the Administration.

It should be verified that life-saving appliances not covered by tests referred to in this Recommendation meet the applicable requirements of the LSA Code.

1.2.1 The lifebuoys should be alternately subjected to surrounding temperatures of -30°C and +65°C. These alternating cycles need not follow immediately after each other and the following procedure, repeated for a total of 10 cycles, is acceptable:

- .1 an 8 h cycle at +65°C to be completed in one day; and
- .2 the specimens removed from the warm chamber that same day and left exposed under ordinary room conditions until the next day;
- .3 an 8 h cycle at -30°C to be completed the next day; and
- .4 the specimens removed from the cold chamber that same day and left exposed under ordinary room conditions until the next day.

1.3 Drop test

The two lifebuoys should be dropped into the water from the height at which they are intended to be stowed on ships in their lightest seagoing condition, or 30 m, whichever is the greater, without suffering damage. In addition, one lifebuoy should be dropped three times from a height of 2 m on to a concrete floor.

10 POSITION-INDICATING LIGHTS FOR LIFE-SAVING APPLIANCES

10.1 Survival craft and rescue boats light tests

10.1.1 Twelve liferaft canopy lights, lifeboat enclosure or lifeboat cover lights, as the case may be, and twelve survival craft interior lights should be subjected to the temperature cycling as prescribed in 1.2.1. If the same type of light is used for both canopy, enclosure or cover and interior, only twelve lights of that type need to be tested. If the lifeboat enclosure light, the lifeboat cover light or the lifeboat internal light is connected to the lifeboat's electrical network and can be supplied with electrical power from any one of the lifeboat's batteries as well as from the lifeboat's engine-driven generator set, the light should only be subject to the test as far as practicable.

10.1.2 In the case of sea-activated power sources, four survival craft lights of each type should, following at least ten complete temperature cycles be taken from a stowage temperature of -30°C and

be operated immersed in seawater at a temperature of -1°C ; four of each type should be taken from a stowage temperature of $+65^{\circ}\text{C}$ and be operated immersed in seawater at a temperature of $+30^{\circ}\text{C}$; and four of each type should be taken from ordinary room conditions and operated immersed in fresh water at ambient temperature. The canopy, enclosure or cover lights should be of white colour and should provide a luminous intensity of not less than 4.3 cd in all directions of the upper hemisphere for a period of not less than 12 h (see 10.4). The interior lights should provide sufficient luminous intensity to read survival instructions and equipment instructions for a period of not less than 12 h.

10.1.3 In the case of dry-activated power sources, provided they will not come into contact with seawater, four survival craft lights of each type should, following at least ten complete temperature cycles be operated at an air temperature of -30°C , four of each type at an air temperature of $+65^{\circ}\text{C}$, and four of each type at ambient temperature. The canopy, enclosure or cover lights should be white in colour and should provide luminous intensity of not less than 4.3 cd in all directions of the upper hemisphere for a period of not less than 12 h (see 10.4). The interior lights should provide sufficient luminous intensity to read survival instructions and equipment instructions for a period of not less than 12 h.

10.1.4 In the case of a flashing light, it should be established that the rate of flashing for the 12 h operative period is not less than 50 flashes and not more than 70 flashes per minute and the effective luminous intensity is at least 4.3 cd (see 10.4).

10.2 Lifebuoy self-igniting light tests

10.2.1 Three self-igniting lights should be subjected to temperature cycling as prescribed in 1.2.1.

10.2.2 After at least ten complete temperature cycles, one self-igniting light should then be taken from a stowage temperature of -30°C and operated immersed in seawater at a temperature of -1°C , and another should be taken from a stowage temperature of $+65^{\circ}\text{C}$ and operated immersed in seawater at a temperature of $+30^{\circ}\text{C}$. Both lights should be of white colour and should continue to provide a luminous intensity of not less than 2 cd in all directions of the upper hemisphere or, in the case of a flashing light, flash at a rate of not less than 50 flashes and not more than 70 flashes per minute with at least the corresponding effective luminous intensity for a period of not less than 2 h (see 10.4).

At the end of the first hour of operation the lights should be immersed to a depth of 1 m for 1 min. The lights should not be extinguished and should continue operating for at least an hour longer.

10.2.3 A self-igniting light should be subjected to two drop tests into water as prescribed in 1.3. The light should be dropped twice, first by itself and then attached to a lifebuoy. The light should operate satisfactorily after each drop.

10.2.4 A self-igniting light should be allowed to float in water in its normal operating position for 24 h. If the light is an electric light, it should be disassembled at the end of the test and examined for the presence of water. There should be no evidence of water inside the light.

10.2.5 The remaining self-igniting light, which has been subjected to the test in 10.2.1 should be immersed horizontally under 300 mm of water for 24 h. If the light is an electric light, it should be

dismantled at the end of the test and examined for the presence of water. There should be no evidence of water inside the light.

10.2.6 If a self-igniting light has a lens, the light should be cooled to -18°C and dropped twice from a height of 1 m on to a rigidly mounted steel plate or concrete surface. The distance should be measured from the top of the lens to the impact surface. The light should strike the surface on the top centre of the lens. The lens should not break or crack.

10.2.7 A self-igniting light should be placed on its side on a rigid surface and a steel sphere having a mass of 500 g should be dropped from a height of 1.3 m on to the case three times. The sphere should strike the case near its centre on one drop, approximately 12 mm from one end of the case on another drop and approximately 12 mm from the other end of the case on the third drop. The case should not break or crack, or be distorted in a way that would affect its watertightness.

10.2.8 A force of 225 N should be applied to the fitting that attaches the light to a lifebuoy. Neither the fitting nor the light should be damaged as a result of this test.

10.3 Lifejacket light tests

10.3.1 Twelve lifejacket lights should be subjected to temperature cycling as prescribed in 1.2.1.

10.3.2 After at least ten temperature cycles, four of these lifejacket lights should be taken from a stowage temperature of -30°C and then be operated immersed in seawater at a temperature of -1°C . Four should be taken from a stowage temperature of $+65^{\circ}\text{C}$ and then immersed in seawater at a temperature of $+30^{\circ}\text{C}$ and four should be taken from ordinary room conditions and operated immersed in freshwater at ambient temperature. Water-activated lights should commence functioning within 2 min and have reached a luminous intensity of 0.75 cd within 5 min in seawater. In fresh water a luminous intensity of 0.75 cd should have been attained within 10 min. At least 11 out of the 12 lights, which should all be of white colour, should continue to provide a luminous intensity of not less than 0.75 cd in all directions of the upper hemisphere for a period of at least 8 h.

10.3.3 One light attached to a lifejacket should be subjected to a drop test as prescribed in 2.9.6. The light should not suffer damage, should not be dislodged from the lifejacket and should function as prescribed in 10.3.2.

10.3.4 One light should be dropped from a height of 2 m onto a rigidly mounted steel plate or concrete surface. The light should not suffer damage and should be capable of providing a luminous intensity of not less than 0.75 cd for a period of at least eight hours when operated immersed in freshwater at ambient temperature.

10.3.5 In the case of a flashing light it should be established that:

- .1 the light can be operated by a manual switch;
- .2 the rate of flashing is not less than 50 flashes and not more than 70 flashes per minute; and
- .3 the effective luminous intensity is at least 0.75 cd (see 10.4).

10.4 Common tests for all position-indicating lights (additional lights are required to carry out the environmental tests.)

10.4.1 *Vibration Test*

Regulations: IEC 945 : 3rd edition (Nov. 1996), paragraph 8.7

Test procedure

One unit shall be subjected to a vibration test according to IEC 945 : 3rd edition (Nov. 1996), paragraph 8.7.

Acceptance Criteria

The lights shall function after the test.

10.4.2 *Mould growth test*

Regulations: LSA Code 1.2.2.4

Test procedure

One unit should be subjected to the mould growth test.

(Note: The mould growth test may be waived where the manufacturer is able to produce evidence that the external materials employed will satisfy the test.)

The light shall be inoculated by spraying with an aqueous suspension of mould spores containing all the following cultures:

Aspergillus niger;
Aspergillus terreus;
Aureobasidium pullulans;
Paecilomyces variotii;
Penicillium funiculosum;
Penicillium ochro-chloron;
Scopulariopsis brevicaulis; and
Trichoderma viride.

The light shall then be placed in a mould growth chamber which shall be maintained at a temperature of $29^{\circ}\text{C} \pm 1^{\circ}\text{C}$ and a relative humidity of not less than 95%. The period of incubation shall be 28 days. After this period the light shall be inspected.

Acceptance criteria

The light shall be rot-proof and not be unduly affected by fungal attack. There shall be no mould growth visible to the naked eye and the light shall function after the test.

10.4.3 *Switch Arrangement Test*

Test procedure

One unit shall be subjected to the switch arrangement test. A person, wearing immersion suit gloves, must be able to switch the light in its normal operational position on and off three times.

Acceptance criteria

The light must function properly.

10.4.4 *Corrosion and seawater resistance test*

Test procedure

One unit shall be subjected to a corrosion and seawater resistance test according to IEC 945 : 3rd edition (Nov. 1996), paragraph 8.12.

- (Note: .1 If there are no exposed metal parts the Corrosion and Seawater Resistance Test need not be conducted.
- .2 The Corrosion and Seawater Resistance Test may be waived where the manufacturer is able to produce evidence that the external metals employed will satisfy the test.)

Acceptance criteria

There shall be no undue deterioration of metal parts and the unit shall function.

10.4.5 *Solar radiation test (not for survival craft interior and lifejacket lights)*

Test procedure

One unit shall be subjected to a solar radiation test according to IEC 945 : 3rd edition (Nov. 1996), paragraph 8.10.

- (Note: The Solar Radiation test may be waived where the manufacturer is able to produce evidence that the materials employed will satisfy the test, i.e. UV stabilised.)

Acceptance criteria

The mechanical properties and labels of the unit shall be resistant to harmful deterioration by sunlight. The unit shall function after the test.

10.4.6 *Test for oil resistance (not for survival craft interior lights)*

Test procedure

lowest recorded voltage a light output test can be carried out as described below. The voltage of the specified number of test units should be monitored continuously for the specified time. To make sure that all the test units provide a luminous intensity of not less than the specified luminous intensity in all directions of the upper hemisphere after the specified time of operation, the following test shall be performed.

It must be demonstrated that at least one light from each of the specified temperature ranges reaches the required luminous intensity in all directions of the upper hemisphere when using a photometer which is calibrated to the photometric standards of the appropriate National or State Standards Institute. (Note: CIE Publication No. 70 contains further information.) The lowest voltage light of the cold temperature test sample lot, the highest voltage light of the high temperature test sample lot and the mean voltage light of the ambient temperature sample lot should be selected. These three lights must be used for the light output tests. In the event that a lamp filament burns out during the light output test, a second light from the same performance test lot may be used.

Luminous intensity should be measured by a photometer directed at the centre of the light source with the test light on a rotating table. Luminous intensity should be measured in a horizontal direction at the level of the centre of the light source and continuously recorded through a 360 degree rotation. These measurements should be taken in the azimuth angles at 5 degree intervals above the horizon up to the single measurement at 90°, (vertical). Luminous intensity should then be measured in a vertical direction, beginning at the centre of the light source at the point of lowest recorded light output, and continuously recorded through an arc of 180°.

Acceptance criteria

The test lights shall continue to provide a luminous intensity of not less than the specified intensity in all directions of the upper hemisphere for a period of at least the specified time. All measured data of luminous intensity and voltage shall be documented. In the case of a flashing light, it shall be established that the rate of flashing for the specified operating period is not less than 50 flashes and not more than 70 flashes per minute and that the effective luminous intensity is at least the minimum specified intensity in all directions of the upper hemisphere. The effective luminous intensity is to be found from the formula:

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where:

I is the instantaneous intensity, 0.2 is the Blondel - Rey constant and t_1 and t_2 are time-limits of integration in seconds.

Note: Flashing lights with a flash duration of not less than 0.3 s, not including incandescence time, may be considered as fixed lights for the measurement of luminous intensity. Such lights shall provide the required luminous intensity in all directions of the upper hemisphere. (Incandescence time is the time interval between switch on and the luminous intensity reaching the required minimum luminous intensity.)

10.4.10 Chromaticity

Test procedure

One unit shall be tested for chromaticity to determine that it lies within the boundaries of the area "white" of the diagram specified for each colour by the International Commission on Illumination, (CIE). The chromaticity of the light shall be measured by means of colorimetric measurement equipment which is calibrated to the appropriate National or State Standards Institute. (Note: CIE Publ. No. 15.2 contains further information.) Measurements on at least four points of the upper hemisphere shall be taken.

Acceptance criteria

The measured chromaticity coordinates should fall within the boundaries of the area of the diagram, as per CIE. The boundaries of the area for white lights are given by the following corner co-ordinates:

x	0.500	0.500	0.440	0.300	0.300	0.440
y	0.382	0.440	0.433	0.344	0.278	0.382

(International standard on Colours of Light Signals, with colour tables to be developed by CIE.)